TECHNICAL REPORT
NATICK/TR-08/012

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MASSACHUSETTS STATE POLICE SPECIAL TACTICAL OPERATIONS TEAM USER FOCUS GROUP REPORT--LAW ENFORCEMENT ADVANCED PROTECTION (LEAP) DUTY UNIFORMS, INTEGRATED HEAD PROTECTION, CHEMICAL/BIOLOGICAL PROTECTION AND HUMAN SYSTEMS INTEGRATION

by
Thomas E. Creighton, II
Bradley Hibbard
Stephen Doherty
and
Kelly McManus

CTC, Inc.
Westborough, MA 01581

May 2008

Final Report
August 2007 – September 2007

Approved for public release; distribution is unlimited

Prepared for
U.S. Army Natick Soldier Research, Development and Engineering Center
Natick, Massachusetts 01760-5019

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REPORT DOCUMENTATION PAGE

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
05-05-2008	FINAL	August 2007-September 2007

4. TITLE AND SUBTITLE
MASSACHUSETTS STATE POLICE SPECIAL TACTICAL OPERATIONS TEAM USER FOCUS GROUP REPORT - LAW ENFORCEMENT ADVANCED PROTECTION (LEAP) DUTY UNIFORMS, INTEGRATED HEAD PROTECTION, CHEMICAL/BIOLOGICAL PROTECTION AND HUMAN SYSTEMS INTEGRATION

5a. CONTRACT NUMBER
W911QY-07-C-0035

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Thomas E. Creighton, II, Bradley Hibbard, Stephen Doherty and Kelly McManus

5d. PROJECT NUMBER
LEAP-CB-SAP

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
CTC, Inc.
Public Safety Technology Center
134 Flanders Road., Suite 375
Westborough, MA 01581

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC)
ATTN: AMSRD-NSR-TS-H (S. Castellani)
Natick, MA 01760-5019

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
NATICK/TR-08/012

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
This report should not be considered the official position of the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC). This report reflects the comments and opinions of the law enforcement **Cont'd on reverse**

14. ABSTRACT
This focus group report documents the findings of a Law Enforcement Advanced Protection (LEAP) Requirements User Focus Group held on August 15, 2007 at Devens, Massachusetts. This focus group is one in a series of personal protective equipment (PPE) related user focus groups for members of the law enforcement community. Its purpose was primarily to collect data/criteria for operational requirements, and to identify PPE trends and concepts of operations (CONOPS) from representatives within the law enforcement community. This focus group consisted exclusively of personnel assigned to the Massachusetts State Police Special Tactical Operations (STOP) Team. Participants were all members of a specialized tactical operations team with consistency in training and use of protective equipment. The focus group included discussions related to PPE integration and compatibility concerns; chemical/biological (CB) PPE and systems; law enforcement special operations tactical uniforms; and law enforcement duty uniforms standards related issues. Data collected through this focus group, coupled with on-going research and analysis, will be used in a number of LEAP-related efforts, including the development of performance criteria for law enforcement specific PPE standards.

15. SUBJECT TERMS
POLICE FOCUS GROUP PROTECTIVE SUIT PROTECTIVE EQUIPMENT INTEGRATED SYSTEMS SURVEYS HEAD(ANATOMY) DATA COLLECTION PERFORMANCE CRITERIA PROTECTIVE CLOTHING UNIFORMS LAW ENFORCEMENT HUMAN SYSTEMS INTEGRATION CONOPS(CONCEPT OF OPERATIONS) HELMETS CB PROTECTION OPERATIONAL REQUIREMENTS PPE(PERSONAL PROTECTIVE EQUIPMENT)

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Stephanie Castellani
U	U	U	SAR	30	19b. TELEPHONE NUMBER *(Include area code)* 508-233-5424

Box 13 Cont'd
professionals who participated in this focus group. Law Enforcement personnel should consider all aspects of personal protective equipment's performance in determination of its suitability for any required application.

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PREFACE

The U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) conducted a Law Enforcement Advanced Protection (LEAP) Requirements User Focus Group August 15, 2007 at Devens, Massachusetts. This was a collaborative effort in cooperation with the Department of Homeland Security, Office of Science and Technology, Office of Standards (DHS/S&T), the National Institute of Standards and Technology – Office of Law Enforcement Standards (NIST/OLES), the National Institute of Justice, Office of Science and Technology (NIJ/OST) and the Center for Technology Commercialization (CTC). This effort was conducted under contract number W911QY-07-C-0035 during August through September 2007.

This focus group consisted exclusively of personnel assigned to the Massachusetts State Police – **S**pecial **T**actical **Op**erations (STOP) Team. Participants were all members of a specialized tactical operations team with consistency in training and use of protective equipment. This effort supports the LEAP Program and is one in a series of personal protective equipment (PPE) related user focus groups for members of the law enforcement community. Its purpose was to collect data/criteria for operational requirements, PPE trends and concepts of operations (CONOPS) from representatives in the law enforcement community with specialized operational assignments. Focus group topics were as follows:

- Integrated Head Protection;
- Chemical/Biological Protection;
- Duty Uniforms; and
- Human Systems Integration.

The focus group included discussions on PPE integration and compatibility concerns; chemical/biological (CB) PPE and systems; law enforcement special operations tactical uniforms; and law enforcement duty uniforms standards related issues.

Each topic produced information specific to that area, including needs and threat requirements. Significant concerns, comments and conclusions by the law enforcement professionals in topic areas were:

Integrated Head Protection discussions focused on the tactical response area. Participants identified headgear suspension and strapping system problems as their primary concerns. Vision and system integration problems associated with helmet shields were also major concerns.

Duty Uniform deliberations were separated into sessions related to the *traditional duty uniform* and the *tactical uniform*. Department traditions and appearance standards make modifications to the duty uniform difficult. This is particularly true with the *traditional duty uniform*. Uniform comfort and quality varies vendor to vendor due to the lack of law enforcement standards. Participants felt that currently available improved fabrics

could enhance the uniform's comfort and functionality without negatively impacting appearance standards.

Chemical/ Biological Protection discussions were centered on personal protective equipment (PPE) concerns related to mobility, vision, durability, comfort and functionality. Costs, storage and training issues were identified as factors that limit PPE procurement and serviceability.

Human Systems Integration considerations were incorporated into topic discussions to obtain an overall view of operational needs in the tactical environment. These discussions were designed to identify current limitations and recommendations for future improvements. Participants suggested developing an integrated "layered systems" approach to improve the protective and operational capabilities of law enforcement personnel.

Data collected through this focus group will be used with ongoing research and analysis to support a number of LEAP-related activities, including development of performance criteria for law enforcement specific PPE standards.

MASSACHUSETTS STATE POLICE SPECIAL TACTICAL OPERATIONS TEAM USER FOCUS GROUP REPORT - LAW ENFORCEMENT ADVANCED PROTECTION (LEAP) DUTY UNIFORMS, INTEGRATED HEAD PROTECTION, CHEMICAL/BIOLOGICAL PROTECTION AND HUMAN SYSTEMS INTEGRATION

1.0 Introduction

1.1 - Evaluation Objectives

The focus group comprised three primary facilitated discussion segments: Integrated Head Protection, Duty Uniforms and Chemical/Biological Protection. Discussions on Human Systems Integration were incorporated into each discussion segment. The purpose of this focus group was to facilitate discussions about the following areas:

- **Integrated Head Protection**, reviewing the current state of protection and perceived threats, baseline requirements, head borne capability needs and integration issues.

- **Duty Uniforms**, emphasizing the current state of protection, the need for improved uniforms and standards, identifying perceived threats, appearance needs, durability considerations and integration issues.

- **Chemical/Biological Protection**, examining the current state of protection, perceived threats, wear and operational considerations and integration issues.

- **Human Systems Integration,** emphasizing overarching integration concerns.

The goal of this focus group was to further refine law enforcement needs and performance criteria in multiple PPE technology areas.

1.2 - User Focus Group Overview

Subject
User focus group for members of the law enforcement (LE) community, representing personnel assigned to specialized operational assignments to discuss their needs and opinions relating to

- Integrated Head Protection;
- Duty Uniforms;
- Chemical/Biological Protection; and
- Human Systems Integration.

Location and Date
Massachusetts State Police Barracks at Devens, Massachusetts on August 15, 2007

Sponsor
Department of Homeland Security, Office of Science and Technology, Office of Standards

Host Activity
The U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC), and the National Institute of Standards and Technology – Office of Law Enforcement Standards (NIST-OLES)

Participants
Massachusetts State Police – Special Tactical Operations Team

Facilitator
Chief Stephen Doherty (Retired) – CTC, Inc., Public Safety Technology Center.

1.3 - Participants

Ten members of the Massachusetts State Police - Special Tactical Operations (STOP) Team comprised the focus group. The STOP Team is a highly trained, disciplined tactical team prepared to respond to crisis situations across the Commonwealth of Massachusetts involving use or threatened use of deadly force. Established in 1971, the team provides tactical support and training to law enforcement departments and organizations at the Federal, state, local and military level.

Typical requests for service include situations involving armed barricaded subjects, hostages, high-risk arrest and search warrants, wooded and urban searches for armed suspects and lost/missing persons, dignitary protection, tactical response to armed emotionally disturbed individuals, civil disturbance and riot control situations.

The STOP Team has successfully resolved hundreds of these situations, many involving the combined efforts of Federal and local officers, and other specialized State Police units. The team regularly trains and works closely with members of the Massachusetts State Police (MSP) Hostage Negotiation Team, K9 Unit, Special Emergency Response Team, AirWing Unit, Marine Section and other field and investigative units. Its members are certified in many tactical disciplines associated with high risk operations including entry into hazardous environments such as clandestine drug laboratories and response to Weapons of Mass Destruction events.

In addition to internal team training, the STOP Team also provides external training and instruction to departments and organizations throughout the New England region; a highly successful example being the *Response to the Active Shooter* training program. Following the tragic events of Columbine High School and other school and workplace shootings, the STOP Team recognized the need to train and guide patrol officers responding to these types of incidents. As a result, the team developed and delivers this training program to thousands of officers throughout the New England region.

The MSP STOP Team is staffed with over 30 uniformed officers, 15 of whom are assigned regionally to full-time positions across the state. Members must demonstrate a strong foundation in patrol operations for entry onto the team.

Focus group participants were invited to attend after carefully considering their relevant experience and qualifications. Participants' experience and job functions include day-to-day field operations, training and tactical/specialized operations. All of these personnel functions include activities in the chemical/biological response arena.

1.4 - Focus Group Methodology

Focus Group Proceedings

The three-hour focus group was segmented and presented progressively, beginning with head protection and building on a format that mirrored the reasonably anticipated needs and requirements of the specialized/tactical operations assignment. Personnel assigned to these areas can encounter potential chemical/biological threats.

Focus Group Participants

Focus group participants are all members of the Massachusetts State Police – Special Tactical Operations Team, who receive consistent training and are issued the same types of protective equipment. Team members had just completed a regularly scheduled training session minutes before commencing with focus group discussions. Though all participants represented the same homogenous team, their differing opinions and recommendations fueled robust conversations in the focus group environment.

Focus Group Topic Segments

The focus group comprised three primary facilitated discussion segments: Integrated Head Protection; Duty Uniforms and Chemical/Biological Protection. Discussions on Human Systems Integration were incorporated into each discussion segment.

1.5 - Focus Group Strengths and Limitations

Focus groups can be an effective tool to

- Record experiences and note attitudes supported by qualitative information;
- Identify existing issues or problems with respect to products or policies;
- Explore ideas and concepts; and
- Generate discussion for new ideas and solutions.

Witnessing interactions and evolving opinions from participants with various investments in a concept are underlying strengths of focus groups. Through these interactions, researchers hope to gain insights into user habits and preferences, which would otherwise be less accessible.

Focus groups have limitations in that they may not produce quantifiable and/or statistically significant data and, due to the small number of participants, results should not be generalized as representative of a larger community. Also, it should be noted that ideas generated in focus groups are the views of individuals who may or may not always agree. Though in some cases the group may reach a consensus, this should not be the expectation.

Discussion summaries in this report attempt to represent all views expressed, and note when opinions differ. Finally, due to the nature of focus groups, it can never be guaranteed that participants will express their viewpoints on all intended topics or follow a planned agenda. Though the facilitator tactfully guided the group and kept the discussion on course, participants were not discouraged from speaking their minds or voicing outside concerns they felt were relevant.

2.0 Focus Group Discussion Results

The U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) personnel began the focus group discussions with an introductory explanation of the "human centric" approach to protecting soldiers and its relationship to the Law Enforcement Advanced Protection (LEAP) Program.[1]

The NSRDEC introduction provided a framework for the facilitated discussions. The focus group was organized into three separate sessions addressing integrated head protection, duty uniforms and chemical/biological protection. Discussions on human systems integration were incorporated into each session along with the following topic areas:

- Current State of Protection
- Need for Improved Protection Levels and Standards
- Perceived Threats
- Operational and Functionality Needs
- Systems Integration Needs and Concerns

2.1 - Facilitated Discussion: Integrated Head Protection

Objective: For each participant to describe their current head protection, perceived threats and baseline requirements for protection.

Participants in the discussion about head protection were members of a specialized tactical team. This session was structured to solicit information specific to headgear worn by the participants performing tactical duties and did not address head protection issues relevant to other law enforcement assignments such as patrol, bicycle and motorcycle operations.

[1] LEAP is a Department of Homeland Security (DHS) Office of Science and Technology sponsored, multi-agency program. The program is in the forefront of a national effort to address multi-hazard protection in an integrated systems approach. The purpose of the program is to address related standards, system requirements and performance of an integrated protective ensemble for homeland operations.

2.1.1 - Current State of Integrated Head Protection

Participants identified the Kevlar-based modular integrated communications (MICH) helmet as their current head protection. Overall, participants were satisfied with the MICH system's performance. The helmet has a good suspension and strapping system. Participants spoke candidly about their experiences wearing the MICH and other types of head protection in their tactical assignments, as outlined in the following sections of this report.

- **Comfort/Protection Trade-Offs:** All but one participant would trade a reduced level of ballistic protection for a lighter helmet that would offer higher levels of agility and functionality. Participants felt it important that the helmet provide a high level of protection against the most common occurrences, such as hitting one's head against or getting struck by a hard object. They favored increased comfort over increased ballistic protection. They would also trade reduced ballistic protection for increased surface area (more areas of the head protected) and reduced weight.

  Exception: Participants agreed that the headgear worn by "breachers" should provide a higher level of ballistic protection and that breachers' headgear should be designed to meet their ballistic clothing (vests) as closely as possible to provide a higher level of protection at the expense of comfort. "Breachers" are specially trained members of a tactical team most often responsible for forcibly opening secured doors and clearing blocked avenues of entrance for the team to make its entry. These personnel are at the highest risk of taking large arms fire.

- **Suspension and Strapping System:** Participants agreed that the MICH headgear's suspension and strapping systems were improvements over other models they had worn. However, a primary concern they had was with MICH headgear's propensity to ride forward covering their eyes. One officer commented that, "a helmet offering a high level of ballistic protection is virtually useless if it rides down over your eyes obstructing sight." Participants commented that merely bouncing around, leaning forward or putting yourself into a prone position is enough to cause the helmet to ride back and forth on the head. Comments and recommendations for improvement included:
  - Design the helmet with a slimmer profile in the rear where it meets the vest.
  - Modify the balance of the helmet to provide more stability.
  - Customize sizing rather than use the current out-of-the-box sizing system.

- **Auditory Capability:** Participants reported diminished ability to pick up sounds from behind and suggested auditory design improvements to increase this capability.

2.1.2 - Headgear-Specific Protection Needs

The group was asked to describe the level and types of head-related threats they face based upon operational needs. Their responses and comments are categorized into three primary areas: protection from impact, ballistics and foreign substances.

- **Impact Protection**
  - Protection against blunt trauma, e.g. baseball bat, wooden railing

- **Ballistic Protection**
  - Small arms fire from .308 caliber down, including .223, .556 and .762 rounds, and 12 gauge slugs (greatest threats)
  - Participants believed it unreasonable to expect protection from .50 caliber
  - At the time of this discussion no participants had been exposed to the threat of Improvised Explosive Device (IED) fragmentation. Protection from IED fragmentation may be a future concern if threat levels escalate.

- **Foreign Substance Protection**
  - Participants claim that current helmet construction materials provide a level of protection against foreign substances, such as urine and acids.
  - Liquids tend to run off the helmet and drip onto skin and inner garments.
  - The current foreign substance shield is a flimsy add-on that has gaps between the shield and helmet.
  - Incorporating a lip, gutter or channeling system into headgear would improve protection in this area.

2.1.3 - Additional IHP Protection Needs (Integrated Systems)

The group was asked to identify additional protection needs as they relate to the IHP system. Participants identified additional needs in hearing, face and respiratory protection. Specific responses and comments include:

- **Hearing Protection**
  - Systems' ability to protect from loud noises, e.g. gunfire, explosion.
  - Systems' capability to amplify soft, low-volume sounds as necessary in the tactical environment must be taken into consideration.
  - Flexibility to adapt hearing protection to the particular tactical environment.

- **Face Protection**
  - Face shields must be improved to address fogging problems.
  - Shield fogging is a serious issue that results in impaired vision capability.

- **Respiratory Protection**
  - Participants currently use Powered Air-Purifying Respirators (PAPRs).
  - The PAPRs system helps the fogging problem to some degree due to the constant airflow.

2.1.4 - IHP Systems Integration

The IHP discussion was conducted from viewing the head environment as a "system of sub-systems." The sub-systems were identified as those necessary for officer protection and functionality in the tactical environment.

The suspension and strap system for head protection was a primary concern. Weight and balance shifting of head protection can immediately affect integration and effective operation of other sub-system elements. The more functionality added to the head protection platform, e.g. night-vision equipment, white-lighting systems, etc., the more critical head protection suspension, balance and securing structures become.

Participants were asked to identify integrated "sub-systems" physically located outside the basic headgear itself, which are necessary to perform tasks required in the tactical environment. Participants provided the following list of "sub-systems" the IHP should support:

- NVG (Night Vision Goggles) with power source
- Optional Optics
- White Lighting
- Thermal Imaging
- Face Protection Systems
- Ballistic Shield (such as a "breacher" would require – refer to section 2.1.1)
- Military Specification Face Shield
- Protection from foreign liquid substances, e.g. acids and urine
- Communications Systems
- Microphone and listening devices at a minimum
- Necessary radios and power sources might be better located on the uniform
- Camera System for the transfer of real time information to a Command Post
- Protective Mask Systems
- Respiratory Systems
- Concealment (camouflage system)

Participants were asked to provide ideas and suggestions to correct, or at least mitigate, some of the head protection integration problems cited during the discussions. Suggested improvements include:

- Face Protection Systems
  - Develop an integrated shielding system similar to a pilot's helmet that can be deployed as needed by sliding it down with locking positions for eye protection or full face protection
  - Integrate a fan system that can ameliorate the constant fogging problem, particularly in wet, damp environmental conditions
  - Eliminate or minimize gaps between face shields and the helmet (ballistic and foreign substance protection).

- Foreign Substance Protection
  - Incorporate a lip, gutter or channeling system into headgear to improve protection from helmet run-off and dripping.

- Concealment System
  - Current helmets use a cloth cover for concealment.
  - Use the concealment system to support additional camouflaging such as inserting natural vegetation to match the tactical environment. It was suggested that the integration of netting or a cloth covering with slits or structures to support the insertion of a variety of natural vegetation elements would improve the concealment capability of the helmet system.
  - Make the concealment/camouflaging system readily changeable/removable when transitioning to a different tactical environment.
  - Current paint schemes do not sufficiently break up the helmet profile for concealment.

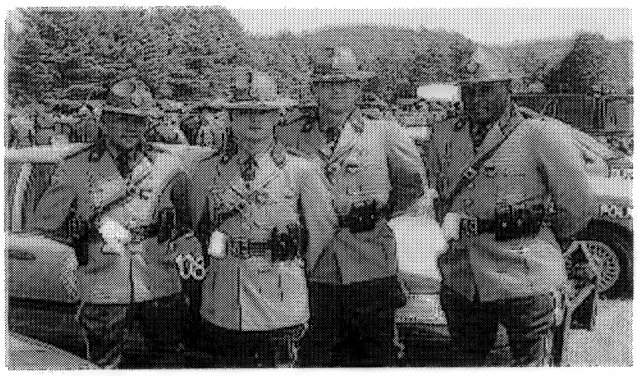
2.2 - Facilitated Discussion: Duty Uniform

Objective: For each participant to describe their current duty uniform and discuss their opinions on the positive and negative features of the uniform.

Depending upon their law enforcement mission, focus group participants' operational assignments require them to wear either the traditional law enforcement duty uniform or the tactical uniform. Focus group discussions were divided into sessions relating to each uniform type.

Focus group participants were all members of the Massachusetts State Police (MSP). The MSP, like many other law enforcement agencies, is steeped in tradition that strongly influences the troopers' appearance. Departmental policy governs the appearance of its personnel and how the uniform is worn. Recommendations for changes to the uniform are generally developed through committee and submitted to the Colonel/Superintendent for approval. The decision to implement changes is influenced by many factors including available funding.

2.2.1 - Current State of Protection



The *traditional duty uniform* is the officer's most basic personal protective equipment and is most often worn by personnel assigned to the patrol function. The *traditional duty uniform* identifies the wearer as an agent of the police and is the first layer of defense for every officer. Typically, the first responder does not have the opportunity to don additional protective equipment, as the particular threats and hazards of an incident are not always known or identifiable at the time of arrival. The duty uniform is the only PPE component global in its application.

The *tactical uniform* is worn by officers performing specialized operational functions including K9, search and rescue, crime scene investigations and special tactical operations (STOP). While there may be minor variations in uniform needs in these groups, basic tactical uniform needs are somewhat similar.

Discussions about the current state of the *traditional duty uniform* resulted in general agreement in the following areas:

- The duty uniform of the Massachusetts State Police is steeped in tradition and has remained virtually unchanged for over 70 years with the exception of improved outer

garments. Improvements to jackets/raingear, which enhance officer comfort and safety (reflective materials), have been adopted and accepted by the department.

- The department purchases and provides the duty uniform to officers. Fabric quality varies somewhat by vendor.

- Participants were unanimous in their opinion that the distinctive appearance was what they liked most about the *traditional duty uniform*.

- Participants agreed that comfort and functionality could be improved, but were unwilling to sacrifice the traditional appearance for these enhancements.

Discussions on the current state of the *tactical uniform* resulted in general agreement in the following areas:

- The department purchases and provides the *tactical uniform* to officers who have special operational assignments.

- Tradition does not have the same impact on the appearance of the *tactical uniform*.

- Comfort and functionality are more important than traditional appearance.

- Many participants have purchased additional *tactical uniforms* to supplement those provided by the department—some of these uniforms have enhanced design features.

2.2.2 - Need for Improved Duty Uniforms and Standards

Participants generally agreed that current duty uniforms provide limited protection from threats. They articulated their desire to integrate improved protection into duty uniforms. Participants further agreed that industry standards for law enforcement uniforms and equipment are necessary to guide vendors to produce equipment meeting standardized performance needs.

2.2.3 - Uniform Protection Needs

The group was asked to identify the types of protection that the *traditional duty uniform* and the *tactical uniform* should provide based on the respondents' operational needs. Participants identified the following threat categories for which their uniforms should provide protection:

- Flash fire and high heat
- Environmental elements
    - Seasonal and temperature extremes
    - Moisture repellency
- Scrapes, scratches, punctures, and cuts
- Ultra-violet protection
- Insect repellant (particularly in tactical uniform fabrics)

2.2.4 - Uniform Specific Features

The group was asked to describe specific functional and comfort features they would like included in these uniforms. Responses are categorized by uniform type as follows:

Traditional Duty Uniform

- Uniform and professional appearance
- More sizing options or tailoring availability
- Increased range of motion
- "Breathable" fabric to accommodate sweat and extreme heat conditions
- Stretchable fabric (without appearing bulky)
- Reinforced fabric in knees and wear points
- MSP winter uniform (boots & breeches) are functionally restrictive and uncomfortable; however, culture is unwilling to sacrifice distinctive appearance for increased functionality

Tactical Uniform

- Concealment
- Friend or foe identification markings, e.g. glint tape
- Ability to remove insignias and markings easily
- Fade resistant / colorfastness
- Machine washable
- Quality fabric and craftsmanship
- Stretchable fabric
- Reduced fabric weight is preferable
- "Breathable" fabric to accommodate sweat and extreme heat conditions
- Reinforced fabric in knees, joints & wear points

- Basic load bearing and carrying capabilities (cargo & shoulder pockets)
    - Cargo pockets located on the lower thigh and calf areas. Holsters, masks and other belt-carried gear inhibit access to pockets located in the upper thigh area.)
- Functional pockets
    - Easy access and capacity
    - Similar to Army Combat Uniform (ACU) and Tru-Spec™ uniform pockets
- Integrated pockets in knee areas for inserting soft knee pads
- Be cognizant of design features that result in unnecessary noise, e.g. excessive use of Velcro systems in pockets

2.2.5 - Appearance Needs

Participants agreed that appearance is extremely important to an officer's image and safety. A well kept, professional-looking uniformed officer projects confidence, attention to detail and command presence. It was generally held that some officers do not wear the uniform well due to problems with sizing, tailoring, and lack of attention to detail. Participants provided the following comments relating to duty uniform appearance and image needs and some of the problems that impact these needs:

- The uniform must be recognizable and identify the wearer as a law enforcement or government agent.

- Shirts tend to pull out of trousers.

- Some officers order larger uniforms, sacrificing a neat and professional appearance for increased functionality and range of motion.

- Magnesium residue from highway flares burns holes in fabric, which results in minor burn injuries and the need to repair/replace uniform components.

- Insufficient fabric reinforcement/durability in pocket areas (Most officers carry knives in their pockets – knife sheath clips wear holes in pockets.)

- Buttons at collars and cuffs need additional reinforcement as they commonly have to be replaced.

- Uniform fabric and craftsmanship vary vendor wide due to lack of law enforcement specific uniform standards.

- The MSP provides cleaning of uniforms ensuring consistency in laundering services.

- Residual dry cleaning chemicals create a distinctive odor when uniforms get wet.

2.2.6 - Durability Considerations

Participants reported satisfaction with uniform durability and life cycle. The Massachusetts State Police routinely replaces worn uniform parts as needed. The normal life cycle of current uniforms was reported as:

- *Traditional Duty Uniform* – approximately 8 – 10 years
- *Tactical Uniform* – approximately 2 – 3 years

Although uniforms generally last for the stated life cycles, operational demands may necessitate replacing them more frequently due to unavoidable damage to uniform components.

2.2.7 - Duty Uniform Integration Concerns

Participants were asked if they would prefer greater protection at the expense of additional weight or decreased weight at the expense of less protection in both the traditional duty and tactical uniforms. Their response highlighted their preference for an integrated garment system that could provide increased functionality/protection while minimizing uniform weight.

Law enforcement officers work in myriad seasonal and environmental conditions. This is particularly true in the Northeast where officers face harsh winters, hot summers and rapidly changing weather conditions. Participants suggested developing a layered undergarment system that could be adapted for wear in different climates, seasons and environmental conditions. Many commercially available high performance fabrics could be adapted for use with this type of system.

Participants were also asked to identify and comment on other uniform integration concerns. Information provided includes:

- Gloves currently lack the level of tactility and dexterity needed for operational purposes and do not integrate well with the uniform.
- Design or offer a system that "ties" together gloves and the uniform to prevent contamination of skin areas by foreign substances.
- Holsters, masks and other belt-carried equipment inhibit access to thigh pockets in traditional *tactical uniforms*. As mentioned previously, this can be alleviated by moving or adding pocket locations to the lower thigh area of the uniform.

2.3 - Facilitated Discussion: Chemical / Biological Protection

Objective: For each participant to describe what integration problems currently exist in chemical/biological (CB) personal protective equipment. For each participant to describe their current CB equipment and discuss what, in their opinion, are its positive and negative features.

The discussion on CB personal protective equipment (PPE) was structured to solicit information from MSP troopers who perform specialized tactical functions required by STOP Team members. During a CB incident, tactical units may be called to neutralize a situation in the warm or hot zones of an incident. Such a response could involve alleviating a threat, apprehending a suspect, rescuing a hostage or locating a potential secondary device. Tasks associated with tactical operations in general and the MSP STOP Team in particular include, but are not limited to, the following:

- Dynamic entry
- Clearings and evacuations
- Confined space operations
- Self defense and suspect control
- Rescue missions
- Vehicle assault
- Planning and communications
- Vicinity patrol and security
- Weapons handling
- Night and low light engagements

Tactical units may be required to enter the contaminated area and perform all functions that a tactical team without a full CB-ensemble would carry out.

2.3.1 - Current State of Protection (PPE)

Focus group participants reported that they are prepared to operate in environments requiring up to and including a Level B[2] response. The team relies on support from the State Hazmat Teams and the National Guard Civil Support Team for incidents involving higher levels of contamination. Participants are currently outfitted with the following PPE and garments:

- Level B suits (Gentex Rampart™)
- Nomex™ hoods, butyl gloves and boots
- Battery powered PAPR system

[2] Level B protection consists of chemical-resistant clothing (overalls and long-sleeved jacket; hooded one or two piece chemical splash suit; disposable chemical-resistant one-piece suit), inner and outer gloves, chemical-resistant safety boots and hard hat with pressure-demand full face piece SCBA or pressure-demand supplied-air respirator with escape SCBA. Level B, rather than Level A, protection is used when a high level of respiratory protection is required but less skin protection is needed.

The STOP Team's CB protective equipment and garments were purchased to support law enforcement operations in connection with the Democratic National Convention at Boston, MA during summer 2003 and are three to four years old.

2.3.2 - Need for Improved PPE and Standards

Participants generally agreed that current PPE and garments provide limited protection from threats. Costs and associated storage and training requirements limit the department's ability to outfit personnel to a higher level. Participants further agreed that developing industry standards for law enforcement PPE is necessary to guide vendors to produce equipment that meets standardized performance requirements and that can address the specialized functional needs of the law enforcement community.

2.3.3 – Problems and Concerns with Current CB Protective Garments and Equipment

Participants were asked to identify problems and concerns with their current CB protective garments and equipment that negatively impact their ability to operate effectively in tactical situations. Respondents provided the following information:

Mobility - Participants indicated that it is difficult to walk downstairs and look down while safely traversing with a weapon. Several participants agreed that simply turning one's head is cumbersome while wearing the CB ensemble in a tactical environment. The PAPR hose system is too long and creates a snag hazard. The fan box is overly bulky and negatively impacts the wearer's mobility.

Vision – There was group consensus that wearing the issued CB equipment compromises vision. Peripheral vision is severely compromised. Fogging problems, while improved with the PAPR system, are still an issue.

Durability – Participants report concerns with equipment durability, primarily due to issues related to its improper storage. Most often, equipment is stored and carried in vehicle trunks to allow ready access at critical incidents. Face shields get scratched negatively impacting vision. Friction created by carrying the PAPR causes rips and tears in equipment and garments. Dry rot of equipment strapping is also an issue.

Comfort – The closure mechanism at the neck for the CB garment includes a pull string tie that is uncomfortable and difficult to secure. It is difficult, if not impossible in some cases, to seal the system without resorting to a "buddy" system. The closure system is uncomfortable

and restricts the wearer's ability to look down. Protective garments trap body heat and moisture, and reduce the wearer's ability to effectively operate in a tactical environment.

Dexterity – Bulky gloves reduce the wearer's dexterity.

Decontamination – Equipment decontamination and cleaning could be improved with integration upgrades. Participants suggested a "layered system" where outer garments and equipment could be stripped away for decontamination and cleaning much more efficiently and effectively than decontaminating a single integrated piece of PPE. This would also allow for added security that the system would avoid cross contamination as a result of the decontamination process.

2.3.4 - Chemical/Biological PPE Integration Issues

Because of the makeup of this focus group, comments should be taken in the context that the participants represented only one agency, with all members using identical PPE. The integration discussion focused on identifying PPE system enhancements that would improve equipment effectiveness and address some issues mentioned in 2.3.3. By consensus, participants provided the following suggestions and recommendations:

PAPR System

- Shorten the length of the hose system.
- Modify the equipment to allow the filter to attach directly to the mask or integrate the filter into the mask.
- Reduce the size and configuration of the fan box.

CB Garments

- Change the neck closure system to be more comfortable and easier to operate. It was suggested that a Velcro-type system would be an improvement.
- Make it easier to step into the CB suit – maybe integrate a zipper into the lower leg/calf area to facilitate suiting up with boots on.
- Configure the CB suit as a one-piece garment instead of the current two-piece system. A configuration similar to a one-piece jump suit with an attached hood and boots covering the body from head-to-toe would make the suit easier to don and provide a higher level of user confidence due to fewer gaps in protection.
- Integrate ballistic material into the rear of the hood for increased ballistic protection.
- Design a layered-system approach. One participant suggested the following system:
    - An inner body suit (body condom) to protect the user's skin
    - Layering additional protection and attachable protective equipment to match the CB threat level would allow stripping away higher levels of protection as the threat level decreases (moving to an area of lower risk) while increasing the wearer's comfort and functionality.
    - Layer additional clothing to address environmental conditions (heat and cold).

    - Position bulky equipment on the outer portions of the system. Since that equipment is most likely to get contaminated, it can be stripped off more easily for decontamination.
- Design a breathable or micro-cooled inner body suit to facilitate cooler user working conditions/temperatures.
- Integrate a user hydration system into the CB ensemble. Design the system with a reduced capacity of 20-30 ounces of fluid to address operational purposes.
- Design equipment used in the CB environment with larger ergonomic dials to facilitate increased dexterity, e.g. communications and environmental monitoring equipment.
- Focus on increased tactility, dexterity, mobility and visibility in future design.

3.0 Conclusions

Participants in this focus group were all members of a specialized tactical team in the same department having statewide jurisdiction. Although their primary assignment is tactical, the participants are also responsible for delivering traditional law enforcement services. The group was comprised of personnel with varying degrees of experience in tactical operations and included the Team Commander. Team members train at least twice monthly to maintain and enhance operational capabilities. These facilitated discussions took place in New England where seasonal and rapidly changing environmental conditions necessitate wearing a protective ensemble that is adaptable to these kinds of circumstances. Participants identified heat and cold conditions as limiting factors in their ability to function effectively and safely in crisis situations.

Integrated Head Protection

During the discussion on head protection, participants were primarily concerned with the problems encountered by the helmet moving around on the head. Although the headgear currently used by the MSP STOP Team is a significant improvement over past equipment, there was consensus that there is still room for considerable improvement in helmet suspension, strapping and balance. Participants were willing to sacrifice a degree of ballistic protection in favor of a lighter helmet that would offer the officer a higher level of agility and functionality.

Participants reported that they commonly use other equipment in conjunction with headgear for added eye, face, respiration and hearing protection. Participants recommended that future modifications and improvements to these "sub-systems" include discussions on integration issues that could potentially impact officer safety, functionality and comfort.

Issues relating to vision were a major concern. In addition to problems related to the helmet riding forward on the head, face shield fit and fogging issues were also identified as critical to officer safety. Participants offered suggestions for improvement including developing an integrated face shield and fan system.

Concealment is important when operating in the tactical environment. Participants discussed current methods of helmet camouflage and suggested improvements in this area as future head protection system modifications are developed.

Duty Uniform

The law enforcement uniform is the most identifiable symbol of the police community and also represents the traditions and identity of the department. These deeply held traditions are most often a challenge to uniform modification, particularly the *traditional duty uniform.*

Participants desired law enforcement specific uniform standards to further delineate the profession's functional and operational needs. Participants also believed that developing law enforcement specific uniform standards would mitigate some of the issues experienced with inconsistent quality control between vendors.

Participants desired increased uniform comfort and functionality, but were reluctant to sacrifice tradition and appearance standards to gain them. This was less of an issue with the *tactical uniform*. Their principal concerns focused on improving fabrics to make them more stretchable and breathable. Participants suggested developing a layered undergarment system adaptable for wear in different climates, seasons and environmental conditions. Participants believed that currently available high-performance fabrics could be used to develop that kind of system.

Specific improvements to the *tactical uniform* ensemble included improved glove tactility and dexterity and moving or adding cargo pockets to the lower thigh area of the uniform.

Chemical/Biological Protection

Participants agreed that developing industry standards for law enforcement protective equipment is necessary to ensure that CB equipment meets the profession's specialized performance and protective needs. Costs, storage and training issues were identified as factors that limit procurement and serviceability of PPE.

Discussions about CB protection centered on issues related to mobility, vision, comfort, durability and decontamination of equipment and garments. The group suggested improvements and advocated for enhanced systems integration.

Specific recommendations included developing a micro-cooling system worn in conjunction with the CB suit and integrated with a hydration system. The group also discussed developing a layered-protection system including an inner body suit to protect the wearer's skin with additional garment layers to address specific protective and environmental needs.

Human Systems Integration

Systems integration considerations were incorporated into each topic area to obtain an overall view of operational needs in the tactical environment. These discussions were designed to identify current limitations and solicit suggestions for future improvements.

Participants recommended developing a "layered systems" approach for uniforms and CB protective garments and equipment. They suggested that a layered system would provide greater officer safety, comfort and functionality by allowing officers to add or remove garments and/or equipment to meet changing environmental and operational conditions, as well as add a level of safety to the decontamination process.

Lack of a set of national standards for equipment requirements specific to the law enforcement community was a recurring theme of this Law Enforcement Advanced Protection (LEAP) User focus group. These discussions demonstrated the need for law enforcement specific standards based upon the functions performed by police officers, particularly those assigned to specialized tactical operations. Participants also cited quality and functionality differences of protective garments and equipment from vendor to vendor; an issue that they believed could be mitigated through establishing uniform standards for the law enforcement profession.

This document reports research undertaken at the U.S. Army Natick Soldier Research, Development and Engineering Center, Natick, MA, and has been assigned No. NATICK/TR-08/1012 in a series of reports approved for publication.